



THE COMMONWEALTH OF MASSACHUSETTS

WATER RESOURCES COMMISSION

100 CAMBRIDGE ST., BOSTON MA 02114

REPORT OF THE FINDINGS, JUSTIFICATIONS AND DECISION OF THE WATER RESOURCES COMMISSION Relating to the Approval of the Town of Reading's for an Interbasin Transfer Pursuant to M.G.L. Chapter 21 § 8C

DECISION

On July 12, 2007, by a nine to zero (9-0) vote, the Massachusetts Water Resources Commission (WRC) approved the Town of Reading's request for an Interbasin Transfer for full membership in the MWRA Water Works System. This vote was taken after review of the facts provided by the applicant, analysis of the associated data, and consideration of comments received concerning this proposal.

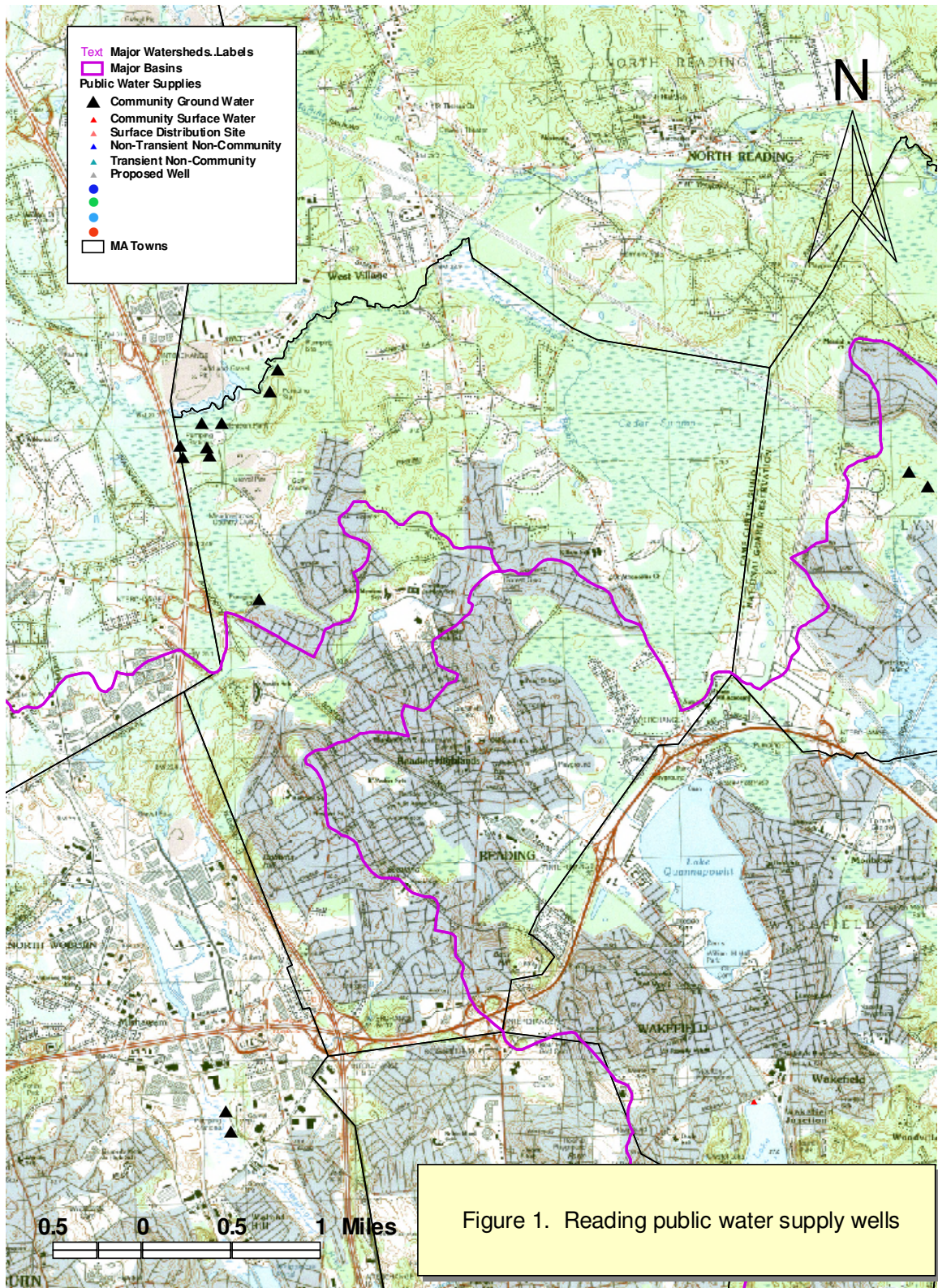
INTRODUCTION

On December 1, 2006, the Massachusetts Water Resources Commission (WRC) received a request for approval of an action to increase the present rate of interbasin transfer under the Interbasin Transfer Act (M.G.L. Chapter 21 §§. 8B-8D) from the Town of Reading. Reading applied to become a full member of the Massachusetts Water Resources Authority (MWRA) Water Works System. In 2005, the WRC approved Reading's request to transfer 219 million gallons per year for the time period from May through October. This latest request, and subject of this review, represents an increase in transfer of 1.67 million gallons per day (mgd). As required by the Interbasin Transfer Act (ITA) regulations (313 CMR 4.05(8)), the WRC has considered the impacts of all past, authorized or proposed transfers on streamflows in the donor basin.

BACKGROUND

In June 2005, the WRC approved an action to increase the present rate of interbasin transfer under the Interbasin Transfer Act (M.G.L. Chapter 21 §§ 8B-8D) from the Town of Reading. The Town was admitted to the MWRA System to purchase up to 219 mg of water annually to supplement its existing water supply sources (Figure 1).

The Town began using its connection to the MWRA water supply system in May 2006, in accordance with the ITA and other approvals. In August 2006, the Massachusetts Environmental Policy Act (MEPA) unit of the Executive Office of Environmental Affairs (EOEA) received a Notice of Project Change (NPC) from Reading requesting a change from purchasing part of its water supply from the MWRA, from May through October, to obtaining all of its water supply from the MWRA year-round. This action was taken in accordance with an Administrative Consent Order (ACO) from the Department of Environmental Protection (DEP), and as a result of water quality problems with the local water supply sources and increased cost estimates for construction of a new water treatment plant.



This proposal would result in Reading abandoning plans to construct the new water treatment plant and placing its existing drinking water supplies on emergency standby status. Reading maintains that the option of constructing a new treatment plant for its sources is not financially viable.

EVALUATION OF THE PROPOSED INTERBASIN TRANSFER

This Interbasin Transfer application was reviewed on its own merits. The Decision was made on facts relevant to the Interbasin Transfer Act and its regulations. The application was evaluated against the eight criteria outlined in the regulations (313 CMR 4.05), as well as the Interbasin Transfer Act Performance Standards and with consideration of comments received through the public comment process.

FACTS PERTAINING TO THE APPLICATION

1. The application for a transfer of an additional 1.67 mgd was part of the SFEIR submitted to MEPA. The Secretary's Certificate on the SFEIR was issued on January 12, 2007, stating no additional MEPA review was necessary. Additional information requested through the MEPA process for ITA review was received on March 26, 2007.
2. Reading has land area in the Ipswich River basin, the Mystic River subbasin of the Boston Harbor basin and North Coastal basin.
3. The Town has nine existing water supply sources in the Ipswich River basin. Estimated capacity for these sources is 8.36 mgd.
4. Reading is stating that these sources are no longer viable, based on contamination threats and the cost of constructing a new water treatment plant. Reading's current water supply sources periodically cannot meet water quality standards (related to disinfection byproducts) and are also threatened by industrial contaminant releases within their Zone I and Zone II wellhead protection areas.
5. Reading is proposing to purchase an additional 1.67 mgd (for a total of 2.27 mgd) to replace its existing water supply sources.
6. The MWRA Waterworks System's sources are located in the Chicopee River basin and the Nashua River basin.
7. The Department of Environmental Protection and the Town of Reading entered into an Administrative Consent Order on August 1, 2006. Provisions of the ACO required that Reading apply for ITA approval, decommission its water treatment plant, and pursue complete reliance on MWRA water supply.
8. Two required public hearings were held to take comment on this application, one in Reading, the receiving basin on April 23, 2007, and one in West Boylston, one of the donor basins, on April 26, 2007.
9. A public hearing to receive comments on the WRC staff recommendation was held on Thursday, May 24th, 2007 at 3:00 PM in Reading MA.
10. Responses to comments received through the public comment period are available in a separate report from the WRC.

SYNOPSIS OF THE EVALUATION CRITERIA (313 CMR 4.05)

<u>Criteria</u>	<u>Application Meets?</u>
Criterion #1: MEPA Compliance	Yes
Criterion #2: Viable In-Basin Sources	Yes
Criterion #3: Water Conservation	Yes
Criterion #4: Forestry Management	Not Applicable
Criterion #5: Reasonable Instream Flow	Yes
Criterion #6: Groundwater/Pumping Test	Not Applicable
Criterion #7: Local Water Resources Management Plan	Yes
Criterion #8: Cumulative Impacts	Yes

BASIS FOR THE WRC DECISION

The Department of Conservation and Recreation's (DCR) Office of Water Resources, DEP's Drinking Water Program and Northeast Regional Office, and the Department of Fish and Game's (DFG) Division of Fisheries and Wildlife and the Riverways Program reviewed this application. This Decision is being made after an evaluation of the project and of Reading's compliance with the six applicable criteria of the Interbasin Transfer Act regulations. The following section describes compliance with the criteria.

Criterion #1: MEPA Compliance

Reading submitted a Notice of Project Change to MEPA in July 2006. The Secretary's Certificate on the NPC was issued on September 14, 2006, directing the Town to prepare a Supplemental Final Environmental Impact Report (SFEIR). The SFEIR contained most of the information required to address the increase in interbasin transfer resulting from this proposal. WRC Staff reviewed the SFEIR and requested additional information through the MEPA process. The certificate on the SFEIR was issued on January 12, 2007, stating no additional MEPA review was necessary, but directing Reading to address the WRC's Request for Additional Information directly with the WRC.

Criterion #2: Viable In-Basin Sources

The Interbasin Transfer Act requires that "that all reasonable efforts have been made to identify and develop all viable sources in the receiving area of the proposed interbasin transfer" (MGL Ch. 21 §8D). This criterion was addressed in depth in the June 2005 WRC ITA Decision, which is incorporated by reference. (The June 2005 Decision is found in Appendix A and is available at <http://www.mass.gov/dcr/waterSupply/intbasin/docs/readingdec.doc>.) It is unlikely that a new water supply source developed in the Ipswich River Basin section of Reading would be able to meet the permitting requirements of the various agencies. However, because Reading also has land in the Mystic River subbasin of the Boston Harbor basin and North Coastal basin, the town evaluated potentially viable sources in those areas of town. None were identified.

Reading has nine existing water supply sources in the Ipswich River basin. Estimated capacity for these sources is 8.36 mgd. Reading's average day demand (2.0 mgd) is well under the capacity of its sources and of its Water Management Act registration (2.57 mgd). Through the ACO, entered into with DEP on August 1, 2006, Reading has been ordered to discontinue use of its local sources.

In addition to existing water quality problems associated with treatment, the DEP notes that the Town's existing water sources are highly susceptible to contamination. Several businesses that use hazardous materials generate hazardous waste, or store oil or hazardous material in above ground or underground tanks, are within the Zone II of the Town's wells. Interstate Route 93 crosses the west side of the protective Zone I area around Well No.15 and Well No. 13.

At the time Reading submitted the ITA application which resulted in the 2005 WRC Decision, the Town had been planning to construct a new water treatment plant and continue use of its local water supply sources at reduced levels, with partial use of MWRA water. After the 2005 Decision, a revised cost estimate for the new treatment plant reached \$24.7 million and the Town determined that this expenditure was 24% more costly than purchasing 100% of its water supply from the MWRA. Water rates are currently 0.86% of the median household income (MHI) in Reading. In 2011, the approximate completion date for construction of a new water treatment facility, water rates are projected to increase to 1.46% of MHI for the treatment plant and partial MWRA water supply alternative and 1.18% of MHI for the full MWRA water supply alternative. Appendix E of the EPA's Information For States on Developing Affordability Criteria for Drinking Water (1998) cites a Water Utility Financing Study as determining that if the annual user charge (i.e. water rate), as a percent of MHI is between 1.5% to 2.5%, the affordability of the system is "questionable". The Department of Environmental Protection's State Revolving Regulations (310 CMR 45.00) include affordability as part of its project selection criteria. Applicants earn points for eligibility for state loans to improve water supply based on the extent to which financial assistance will result in increased water rates to users. The regulations state that, "Relevant factors to consider may include, but are not limited to, whether the annual user charge will fall within a range of 1% to 1.75% of such users' MHI."

The same EPA study (1998) states that if the actual rate increase for a new system is between 100% and 200%, the affordability of the system is "questionable" as well. The statistics for the new water treatment plant in Reading approach these thresholds. Although both alternatives are costly and will result in significant rate increases to consumers, according to information provided by Reading, the treatment plant alternative will result in a 98% rate increase by 2011, compared with a 59% rate increase for full membership in the MWRA for the same time period. Both the project rate as a percent of median household income and the overall percent increase indicate that rates associated with the option of a new water treatment plant combined with partial MWRA water would be on the cusp between the upper range of affordable and the lower range of questionable. This supports Reading's statements that this option is not economically viable.

Reading also compared the costs for the treatment plant construction and full MWRA membership alternatives with "costs recently incurred elsewhere in the Commonwealth" as directed by the ITA regulations (313 CMR 4.02) and in accordance with the ITA Performance Standards Guidance. In addition, Reading presented current water rates as a percent of MHI in neighboring North Shore communities:

<u>Community</u>	<u>Rate as a Percent of MHI</u>
Burlington	0.17
Chelmsford	0.54
Gloucester	1.08
Lynnfield	0.35
Marblehead	0.45
Melrose	0.64
Nahant	1.11
North Reading	0.77
Peabody	0.44
Saugus	0.57
Stoneham	0.57
Swampscott	0.78
Tewksbury	0.58
Wakefield	0.63
Wilmington	0.56
Woburn	0.26

At 0.86%, Reading's current water rates as a percent of MHI are higher than the state median of 0.74% and are significantly higher than all but two neighboring communities in the comparison. With the implementation of either costly water supply alternative in Reading, this difference in affordability between Reading and most of its neighbors would likely increase.

Because of the high cost of constructing a new treatment plant, use of the Town's existing local wells is not economically viable. Therefore, Reading is requesting an interbasin transfer of water from the MWRA to meet the long term water supply needs of the community.

Enhanced Water Conservation

As an additional source of water, Reading has been implementing a four-year, \$1 million conservation program to reduce water usage by 190,000 gallons per day (gpd). This program was discussed in detail in the WRC's 2005 Decision (incorporated by reference).

Criterion #3: Water Conservation

In 2005, the WRC found that Reading's water conservation program met all of the Water Conservation Standards for the Commonwealth of Massachusetts and most of the 1999 Interbasin Transfer Act (ITA) Performance Standards for Criterion #3. The water conservation program was discussed in detail in the WRC's 2005 Decision (See Appendix B). As a condition for approval of the previous ITA request, the WRC required that Reading notify the WRC when the High School and Barrows Elementary School renovations were complete, with documentation of the retrofit devices installed. In addition, the WRC required that Reading provide annual reports detailing the water conservation actions taken as part of the four-year, \$1 million program, including an accounting of the money spent and the successes of the program.

The High School renovation was completed in December 2006. All fixtures in the High School are low flow fixtures which meet the plumbing code. In November 2006, existing faucets in the Barrows School were replaced with water saving faucets. Low flow urinals and toilets will be installed in this school once the school year has ended, in June 2007.

As of October 31, 2006, Reading had spent \$424,000 of the \$1 million appropriated for the four-year water conservation program (which began in FY 2004). This money was used to provide rebates for washing machines, toilets, rain sensors and rain barrels. According to the annual report submitted in March 2007 as a condition of the 2005 Decision, Reading had given \$150,694.78 in rebates for these items through 2006. Additional money was used for a large user water audit/retrofit program. Through this latter program, Reading partnered with Energy New England to conduct water audits at 129 locations, resulting in retrofits of water fixtures at all but two locations.

In its comments on the NPC and SFEIR, Staff requested updates on the water conservation programs described in the June 2005 Decision. Reading provided these updates:

1. Reading continues to perform leak detection surveys annually. The last survey was completed in July 2006. Documentation of the survey was provided.
2. Reading continues to calibrate master meters annually. Documentation of the latest annual calibration was provided.
3. Reading has an active meter replacement program. The Town is currently in the process of replacing all meters with a remote read system.
4. The rate structure is still evaluated annually. Rates were increased in 2006.
5. Reading still bills water supply customers quarterly.
6. Reading completed a system-wide water audit in 2004. The report for the audit was provided.
7. Reading adopted a water use restriction by-law in July 2005 to reflect the 2005 WRC Decision. Outdoor water use was tied to amount of water purchased from the MWRA and streamflow in the Ipswich River. If this transfer is approved, Reading must adhere to a standard of outdoor water use not less stringent than the bylaw currently in effect (July 2005). If Reading further amends this by-law to reflect full membership in the MWRA, Reading must provide details of how water use restrictions will be imposed, including environmental criteria to be used, for approval before the bylaw is adopted by the Town.

Reading's 2006 residential water use was 52 gallons per capita per day (gpcd) and its unaccounted for water represented 5% of overall water use.

Criterion #4: Forestry Management

This criterion refers to surface water sources currently used by the proponent, and so is not applicable to this proposal. Reading's sources are ground water sources.

Criterion #5: Reasonable Instream Flow and Criterion #8: Cumulative Impacts

Reading is proposing to purchase a total of up to 829 million gallons of water from the MWRA annually. This is an average of 2.27 mgd, and includes the original transfer approved in 2005 and the 1.67 mgd requested through Reading's 2006 application. The Town proposes to cease operating its Ipswich River basin wells as soon as practicable, when permitting for the full

MWRA water supply is completed. MWRA's sources are the Quabbin Reservoir and the Ware River in the Chicopee River Basin and the Wachusett Reservoir in the Nashua River basin. Reading is located in the Boston Harbor Basin (Mystic River subbasin), the North Coastal basin, and the Ipswich River basin. Most of Reading's wastewater (90% of the population) is sewered to the Massachusetts Coastal Basin via MWRA's Deer Island Treatment Facility. Approximately 350 on-site wastewater disposal systems are present in Reading, most of which are located in the Ipswich River basin.

The Interbasin Transfer Act regulations (313 CMR 4.05) direct the WRC to consider that "reasonable instream flow in the river from which the water is transferred is maintained" in making its decision to approve or deny an Interbasin Transfer request. In this case, the impacts of transferring 2.27 mgd annual average on the operations of the MWRA Water Works System, were evaluated. This included impacts to reservoir levels, drought levels, uncontrolled releases (spills) and the MWRA's mandated downstream releases. In addition, the cumulative impacts of the Reading transfer and other potential transfers (Wilmington and the redevelopment of the Weymouth Naval Air Station) were evaluated. These proposed additions to the system could result in an additional 5 mgd transferred. MWRA notes that the reservoir system holds four to five years of water in storage, and thus variations in monthly demands do not have a significant impact on the system.

In its analysis of these criteria, the WRC relied on data provided in the Reading's FEIR (2003), Notice of Project Change (2006), SFEIR (2006), plus additional submittals in response to WRC requests, plus information regarding the MWRA system in a document titled, "MWRA Water System Supply and Demand" (MWRA, 2002). Streamflow data for the analysis were obtained from the US Geological Survey, and release data for the MWRA Reservoirs were obtained from the Department of Conservation and Recreation, Office of Watershed Management.

MWRA System

The main components of the MWRA water supply system (**Figure 2**) include the Quabbin and Wachusett Reservoirs, the Ware River intake, and its extensive distribution system. The construction of Winsor Dam on the Swift River was completed in 1939, creating the Quabbin Reservoir within the Chicopee River basin. The Quabbin Reservoir has a watershed area of 186 square miles (**Figure 3**), and maximum storage capacity of 412 billion gallons, equivalent to about four years worth of supply. In addition to the water flowing into the Quabbin directly, Quabbin Reservoir can receive water from the Ware River (also in the Chicopee River basin) via the Ware River intake. The Ware River at the intake has a watershed area of 96.8 square miles. The Quabbin Reservoir is connected by pipeline (the Quabbin Aqueduct) to the Wachusett Reservoir in the Nashua River basin. Wachusett Reservoir has a capacity of 65 billion gallons and a watershed area of 107 square miles (**Figure 4**). The Quabbin Reservoir came on-line in 1948 to supply the public water works system now operated by the MWRA, significantly supplementing the existing reservoir system (including the Wachusett Reservoir) that had been serving the Boston metropolitan area.

The MWRA reservoir system is operated with the primary objective of ensuring high quality adequate water supply. Secondary operational objectives include maintaining an adequate flood protection buffer particularly during the spring melt and hurricane seasons and maintaining

required minimum releases to both the Swift and Nashua Rivers. The MWRA controls Wachusett Reservoir elevation through transfers from Quabbin Reservoir. The objective is to operate Wachusett Reservoir over a narrow operating range (between elevation 390 and 391.5 feet) while allowing Quabbin Reservoir to freely fluctuate. The Quabbin Reservoir elevation at the primary spillway is 530 feet. There is also a smaller, low-level spillway at elevation 528 feet.

The operation of Quabbin Reservoir includes maintenance of a minimum flow in the Swift River at Bondsville (five miles downstream of Winsor Dam) of 20 mgd, or 30 cubic feet per second (cfs). This threshold was mandated in Chapter 321 in the 1927 Acts of Massachusetts. A 1929 War Department permit (now overseen by the Army Corps of Engineers) also requires seasonal releases from the Winsor Dam to maintain flow for navigability on the Connecticut River between June 1 and November 30. The seasonal releases are 70 cfs (45 mgd) if the flow in the Connecticut River, as measured at the Montague stream gage, falls below 4,900 cfs, and 110 cfs (70 mgd) if the flow in the Connecticut River falls below 4,650 cfs.

During its normal operation, the Quabbin Reservoir maintains the required thresholds stated above through controlled releases through a turbine (formerly used for hydropower production) or a turbine by-pass pipe. The by-pass pipe has a capacity of approximately 70 mgd (108 cfs). The reservoir has been historically controlled to maximize safe yield and assure water quality, while at the same time satisfying the regulatory required releases. Uncontrolled releases, or spills, occur periodically over the spillway. Uncontrolled releases are undesirable due to downstream flooding impacts and the rapid increase of high flow these cause.

Transfers from the Ware River to Quabbin Reservoir are only allowed at Ware River flows above 85 mgd (131 cfs), and must be limited to the period from October 15 to June 15. In addition, permission must be obtained from the Army Corps of Engineers to transfer water during the periods of June 1 through June 15 and October 15 through November 30. Under the “limited Ware” approach currently implemented by the MWRA, transfers from the Ware River are made only on a limited basis for flood control or to help fill the Quabbin when Quabbin Reservoir levels are beneath their seasonal normal values. Transfers from the Ware River are avoided as possible.

The streamflow requirements listed above are intended to maintain pre-existing mill operation on the Swift River and navigation on the Connecticut River, but do not take into account the other instream uses which are evaluated when determining a reasonable instream flow. Flow in the Swift River was significantly impacted when the Quabbin Reservoir was built. An Indicators of Hydrologic Alteration (IHA) analysis of pre-1939 flows compared to post-1939 flows indicates that in general, streamflows in the Swift River have been significantly reduced by construction of the reservoir. The mean annual flow has decreased from 313 cfs to 100 cfs. In addition, all monthly flows have been reduced (Gomez and Sullivan Engineers, Overview of Water Use and Transfer in the Chicopee River Basin, 2003).

Minimum releases are also mandated with the operation of the Wachusett Reservoir on the South Branch of the Nashua River. Chapter 488 of the 1895 Acts of Massachusetts requires a release of 12 mg per week or 1.71 mgd (equivalent on average to approximately 2.6 cfs). An additional 12 mg per week can be requested by a downstream mill owner. Similar to the Quabbin

Reservoir and the Swift River, the flow characteristics of the Nashua River were significantly altered when the Wachusett Reservoir was constructed.

Hydrologic Analysis--Overview

The safe yield of the MWRA reservoir system is approximately 300 mgd (MWRA, 2002). Demands on the MWRA water supply system peaked in 1980 at 343 mgd and were above 300 mgd for 20 years. Since this time, MWRA system demand has decreased dramatically as a result of aggressive water conservation efforts, water efficiency initiatives, response to price and rate increases, and regional economic conditions. For Reading's NPC, MWRA estimated a baseline demand for 2006 of 230 mgd (the actual annual withdrawal for 2006 was lower, at 212 mgd and the five-year average for 2002 to 2006 was 224 mgd). The Metropolitan Area Planning Council estimates future demands for the existing system of an additional 13 mgd through 2025. Thus, using the baseline demand of 230 mgd, the interbasin transfer analysis was based on a future demand for the existing system of 243 mgd. Adding the proposed demands from Wilmington, Reading, and Dedham-Westwood (5 mgd) results in a total future demand of 248 mgd. MWRA modeled the impacts of withdrawals ranging from 240 to 300 mgd for evaluation of donor basin impacts. The model results describing a withdrawal of 250 mgd were considered applicable to the Reading interbasin transfer request.

Several types of data are available to evaluate the potential impact of the proposed Reading transfer, as well as any planned or proposed transfers, on the Quabbin Reservoir. Streamflow data, or a hydrograph showing the impact of the proposed transfer on the donor river basin, is usually evaluated as part of an interbasin transfer review. However, several factors make the use of downstream flow data difficult in this case. First, the Quabbin Reservoir has a huge storage capacity, which is used to maintain a constant minimum flow. Second, the current MWRA system demand is significantly lower than its historic demand; therefore superimposing the transfer on a historic downstream hydrograph would not be realistic. For these reasons, other types of data, including releases and reservoir levels, are being used to evaluate these criteria. To account for the change in system demand, some of the analyses have used a shortened period of record on which to superimpose the transfer. Due to the presence of large water supply dams and their associated reservoirs, Aquatic Base Flow (ABF) criteria were not applied to downstream releases, since the outflows from the dams would not reflect the size of the watersheds above the dams on a cubic foot per second per square mile (cfs/m) basis.

The application indicates that in general, given the relatively small size of the Reading transfer in comparison to the capacity of the reservoirs, the magnitude of discharges over the spillway, and the discharges governed by regulatory requirements, the effects on hydraulic characteristics from Reading's withdrawals will be imperceptible. Intended downstream releases at Quabbin, Ware, and Wachusett will not change. There would only be a slight reduction in unintended spillway flows at Quabbin.

Both time series flow graphs and flow duration curves are used to describe river flow conditions. **Figure 5** shows both the time series and flow duration curve for the Swift River at the West Ware gage for the time period of 1950 to 2006. The Swift River West Ware gage is located 1.4 miles downstream from Winsor Dam and has a period of record from 1913 to present. The West Ware gage is located approximately 3.6 miles upstream of the compliance point at Bondsville.

The intervening drainage area between the two points is reported to contribute 4 mgd of base flow (MWRA Water System Supply and Demand, 2002); therefore, releases of at least 16 mgd are made from the Quabbin Reservoir to maintain the minimum 20 MGD flow required at Bondsville. Significant flow variation is evident in the time series graph, and the flow duration curve depicts the very high frequency of flows that exceed the minimum release requirement from the Quabbin Reservoir. For example, releases of 60 mgd are equaled or exceeded approximately 37 percent of the time. The slope of the flow duration curve increases significantly about 100 MGD, reflecting conditions when the maximum release from the bypass has been exceeded and high flows begin over the spillway.

Releases from Wachusett Reservoir typically occur through a fountain on the downstream side of the dam at the headwaters of the Nashua River. Historically there has not been a USGS gage on the South Nashua River, however, MWRA intends to install a new gage downstream of the Wachusett Dam in the near future. Flows are measured by a venturi flow meter and typically are 1.8 MGD in the winter and approximately 1.72 mgd during warmer months when the fountain is in use. Both of these conditions represent an essentially fully open valve at the fountain, so the flows are fairly constant. In addition, approximately 0.4 mgd of water from Wachusett is discharged to Lancaster Mills as non-contact cooling water. This water is discharged to the Nashua River just downstream of the dam. MWRA also estimates that an additional 0.9 mgd of seepage occurs from the Wachusett Reservoir dams and dikes (personal communication, Stephen Estes-Smargiassi, MWRA). A pressure-reducing sleeve valve installed a few years ago allows additional discharges up to 100 mgd. Flows between 1.8 and 100 mgd may be released through a sleeve valve to control the reservoir level or when Wachusett Reservoir is being supplemented with Quabbin water for water quality purposes. These intermediate flows are typically increased in 25 mgd increments over a period of two days (similarly, flows are decreased over a period of two days when the release is completed). Flows above 100 mgd occur when the Wachusett reservoir is spilling over the dam. Weekly release data provided by the DCR Office of Watershed Management for the period of 1938 to 2006 were used in the hydrologic analysis. Average daily flows were calculated from the monthly values for each month during this period. Daily release data were provided for the period of 2002 to 2006, and separate analyses were performed using these data. **Figure 6** shows the time series and flow duration curve for releases from Wachusett Reservoir for the time period of 1938 to 2006. The graphs show that the minimum of 1.71 MGD release or greater occurred 92.5 percent of the time; however, between 2002 and 2006 the minimum release was achieved greater than 99 percent of the time. Flows above 100 MGD (spills) occurred approximated 2.25 percent of the time between 1938 and 2006 and rose to 26 percent of the time during the 2002 to 2006 period.

Figure 7 shows the time series and flow duration curve for the Ware River for the time period of 2002 to 2006. Ware River flows were measured at the USGS gage 01173000, known as Ware River at intake works near Barre, MA from 1928 to 2005. According to MWRA, the Ware intake at Barre was designed to pass the first 85 mgd before flow can be siphoned into the intake. Flow is measured by MWRA using its own meter at the intake. The USGS gage time series has superimposed on it the reduced flow as a result of diversions to the Quabbin Reservoir. Between 2002 and 2005, diversions to the Quabbin were as high as 85 percent of the total flow in the Ware River (e.g., 87 mgd passing the intake, while 507 mgd diverted to Quabbin). However, since the diversions are only allowed at flows exceeding 85 MGD (and the operating practice is

to not divert below 89 mgd), there are no impacts to low flows caused by the diversions. It is noted that diversions from the Ware River to the Quabbin Reservoir are typically only made when the reservoir level is below normal or the Army Corps of Engineers requests it for flood control.

Low Flows

USGS data indicates that the minimum Quabbin release to the Swift River (16 mgd) as measured at the West Ware gage was maintained 99 percent of the time between 1950 and 2006. Because the mandated flow requirements have been maintained, even during periods when demands were nearly 100 mgd over the current level, and through the drought of record, it is assumed that those releases will continue to be met and permit conditions will be satisfied under the proposed transfer demand scenarios, which are significantly less than the historic use. Additional demands from Reading and other proposed users are not expected to affect Swift River releases from the Quabbin Reservoir, which represent the majority of low flows.

Low-flow impacts on Ware River diversions as a result of the additional demands posed by Reading, Wilmington, and the Weymouth Naval Air Station redevelopment are not expected. Ware River diversions are limited to non-low-flow months (November through May), and to periods when flow exceeds 85 mgd.

Data provided by the DCR Office of Watershed Management for the period of 1938 to 2006 indicate that releases from Wachusett Reservoir to the Nashua River have met the 1.71 mgd requirement more than 92.5 percent of the time (99 percent of the time since 2002). Again, additional demands of Reading and other proposed users are not expected to affect Nashua River releases from the Wachusett reservoir.

Intermediate Flows

While only “minimum” release requirements apply to the Quabbin and Wachusett Reservoirs, data indicate that intermediate flows occur as a result of releases above the minimum requirements. Data from the USGS Swift River West Ware gage indicate that flows between 100 mgd and 500 mgd occurred approximately 9 percent of the time for the period of 1950 to 2006. It should be noted that there is a mechanical limitation to intermediate releases from the Winsor Dam. The bypass structure is limited to approximately 70 mgd and the next opportunity for releases is a spill over the low-level spillway.

At the Wachusett Reservoir, flows between 10 mgd and 100 mgd are estimated to have occurred approximately 6 percent of the time for the period of 1938 to 2006 (based on monthly data). During the 2002 to 2006 period, flows between 10 and 100 mgd also occurred approximately 6 percent of the time. The ability to release controlled flows is limited to 100 mgd through the sleeve valve at Wachusett. When possible, more frequent intermediate seasonal flow releases from the Wachusett Reservoir would be beneficial to the Nashua River.

Intermediate flows at the Ware River intake (between 50 to 100 mgd) occurred 38 percent of the time between 2002 and 2006. During this period, at times when the diversion was activated, up to 85% of Ware River flow was diverted, while maintaining at least the minimum 85 MGD downstream release. For the period analyzed (2002 to 2006), the Ware diversion was operated

184 days, or about 27 percent of the time during the intermediate flows. It is acknowledged that Ware diversions are limited based on MWRA's operating principles. Even with the diversions, however, the frequency and magnitude of intermediate flows in the Ware River appears nearly normal.

High Flows

Increasing demands could impact the amount of water that is released from Quabbin. **Figure 8** depicts flows at the Swift River West Ware gage for the period of 1990 to 2003. There does not appear to be any correlation between flows in the Swift River and system demand; rather, variations in flow are related to operational practices as well as climatic conditions. Increasing transfers from the Quabbin Reservoir to meet water quality objectives and to meet increased summer demands decrease the likelihood of spills. The figure also shows that flow variation exists in the Swift River downstream of the Winsor Dam. In particular, high flows occur frequently, although not annually, in the form of uncontrolled spills. During the period of 1950 to 2006, flows above 500 mgd were recorded at the USGS Swift River gage approximately 1 percent of the time. The issue of uncontrolled releases and spring flows at Quabbin are further discussed under the section Impacts to Other Uses, Fisheries. Spills from Quabbin can be undesirable because of their adverse impacts downstream including warm water release to the cold-water fishery and flooding issues.

High flows on the Ware River are impacted by diversions to the Quabbin Reservoir. High flows (above 100 mgd) at the Ware River intake occurred 30 percent of the time between 2002 and 2006. During this period, at times when the diversion was activated, up to 84% of Ware River flow was diverted, while maintaining at least the minimum 85 MGD downstream release. For the period analyzed (2002 to 2006), the Ware diversion was operated only 34 days, or about 6 percent of the time during high flows. As noted previously, Ware diversions are limited based on MWRA's operating principles. Even with the diversions, however, the frequency and magnitude of high flows in the Ware River appears nearly normal. The addition of Reading and other communities considered in this application will not likely have an impact on the use of Ware River diversions or high flows in the Ware River.

Since high flows from the Wachusett reservoir are generally uncontrolled spills, and the reservoir level is intended to be managed to a narrow range of levels, the proposed withdrawals are not considered to have an impact on high flows in the Nashua River. High flows (greater than 100 mgd) are estimated to have occurred approximately 2 percent of the time over the period between 1938 and 2006 (using monthly data); however, the high flows occurred much more frequently (27 percent of the time, based on daily data) between 2002 and 2006.

Quabbin Levels/Drought Analysis

Quabbin Reservoir levels fluctuate by design, but minimum percent full values have been established and are the basis for drought designations. The applicant evaluated maximum pool level reductions at various demands and hydrologic conditions simulated from 1948 through 2000. The results of the analysis are that at the base withdrawal, plus Reading and future community demands (250 mgd total), the maximum pool descent does not vary considerably from current demand conditions. The additional community demands would result in a Quabbin

level descent to elevation above 500 feet, well above the minimum acceptable pool descent of 470 feet elevation. At demands up to 280 mgd, pool levels remain above elevation 490 feet.

An analysis was conducted to determine the impact of the proposed transfer on the Quabbin Reservoir during a drought. Increasing additional demands can impact the frequency with which a reservoir system reaches various drought levels. This analysis of the incremental transfers for Reading and the other communities proposing to use MWRA water is useful to determine impacts to levels in the reservoir as well as impacts to other communities currently on the MWRA system. Analyses of the increase in demand due to the proposed Reading transfer and future community transfers show that the MWRA system would result in an increase in the number of months at Stage 1 (the least significant) drought levels from one to four months over the entire period analyzed. At demands less than 270 MGD, models of drought action thresholds do not show unacceptable impacts to the MWRA system.

Impacts to Flow Characteristics

Interbasin Transfer Act criteria require evaluating impacts of the transfer on specific flow statistics. No impact to the Swift River 95% flow duration (20.0 MGD) is expected compared to existing conditions. The 95% flow duration is equivalent to the state-mandated release requirement of 20 MGD at Bondsville. Data from the Swift River gage indicate that the mandated release has been achieved at virtually all times and it is expected that it will be maintained into the future and will not be affected by the proposed transfer or those of future communities included in this analysis.

Likewise, the 95% flow duration at the Wachusett Reservoir is not likely to be affected by the proposed additional transfers requested by Reading and the other communities. The estimated 95% flow duration for the Nashua River (based on weekly historical release data) is 1.6 MGD, slightly below the 1.71 MGD mandated release. Data provided by the DCR Office of Watershed Management indicate that the mandated release has been achieved at virtually all times since 2002 and it is expected that it will be maintained into the future and not be affected by the proposed transfer. Thus, the 95% flow duration flow is expected to increase slightly with future operations to at least the 1.71 MGD threshold.

The 95% flow duration at the Ware River should not be impacted by the proposed increase in interbasin transfer since Ware River diversions are not allowed during low flow periods.

Impacts to Other Uses

Fisheries

According to the Massachusetts Division of Fisheries and Wildlife, the Swift River below Winsor Dam, down to the confluence with the Ware River, contains significant fisheries habitat. In addition, the river is one of only two rivers in Massachusetts which receive a cold-water release that significantly benefits habitat, such as the catch and release trout fishery directly below the dam. The current required flow releases are beneficial to the fishery, as they provide a continuous source of fresh cold water. DFW operates a trout hatchery downstream of the Winsor Dam on the Swift River, which uses river intakes as part of its water supply. Relatively warm-water spills from the surface of Quabbin Reservoir during the summer can be detrimental to the fish hatchery operation, and high flood flows can damage the river intake.

An instream flow incremental method (IFIM) study of the Swift River in 1997 by Normandeau Associates for MWRA indicated that the current flow releases were adequate to protect the Swift River trout fishery. The study found substantial, large, deep pools in the Swift River that serve as habitat refuge for adult trout. The efficacy of pools as low flow refuges is enhanced by an abundance of overhanging and downed trees that contribute substantial amounts of woody debris.

MWRA and DCR Office of Watershed Management have taken a number of steps to address fisheries issues in the Swift River. The McLaughlin Fish Hatchery's main concerns are related to summer spill water temperature, ramping rates of the extra flows required by the Army Corps permit, and very high flood flow impacts on their river intake. These steps include:

1. Implementation, in the early 1990s, of continuous 24-hour discharges from Quabbin into Swift River all year round, instead of higher releases for 5-7 hour periods.
2. Revision of MWRA operations to more slowly ramp up the higher volume controlled discharges made in the summer months, in response to a request of the Division of Fisheries and Wildlife.
3. Consideration of Fish Hatchery concerns regarding warm water spills in reservoir operating procedures. These procedures consider the placement of stoplogs in Quabbin's lower spillway structure to increase reservoir elevation and decrease spills and increases in cold-water discharges at the dam to offset the warmer surface spillway discharges. These actions usually take place over a short time period with daily discussions between Fish Hatchery and DCR Office of Watershed Management staff.
4. DCR Office of Watershed Management has offered assistance and personnel to design or implement habitat improvements and modifications on the Swift River, in response to suggestions by others that placing sediment and rocks in strategic areas may benefit fish habitat. DCR has also received a state grant to construct a walkway bridge over the upper reach of the Swift River above the "Y Pool" to improve access for fishermen.

MWRA has also made a number of improvements at the Wachusett Dam related to downstream releases. At the request of the Nashua River Watershed Association, MWRA has decreased the ramp-up rate for extra discharges made as an indirect result of water supply quality considerations or for flood control purposes. MWRA has also replaced the valves at the base of the dam to provide better operational control. Since their replacement, planned releases to the South Branch of the Nashua River, particularly in the spring and early summer, have greatly exceeded the minimum flow requirements. Average discharges from 2001 through 2006 were 21 times the minimum requirement.

As part of the review of the first Reading ITA application for MWRA water, approved by the Water Resources Commission in 2005, DFW, MWRA and DCR Office of Watershed Management considered habitat improvements that could be made within the limitations of existing permits. Through a Memorandum of Understanding with MWRA, DCR's Office of Watershed Management ([DCR-OWM](#)) is responsible for developing policies and procedures to be followed during wet weather or flood periods, to enable MWRA to determine how much water (above statutory requirements) is released into the Nashua, Swift, Ware, or Sudbury

Rivers. During winter and spring months when the Quabbin Reservoir is filling to high levels, it may be possible to increase releases to the Swift River (using the Winsor Dam by-pass and/or other future improvements). Winter/spring diversions from the Ware River (in accordance with permitted limitations) may be used to supplement Quabbin and allow for enhancement of higher controlled or variable Swift River releases in the spring months.

Hydropower

A hydropower turbine was in use at the Winsor Dam until 1991, when it was damaged by a fire. The 1997 Normandeau study was commissioned to determine suitable flow levels for fisheries during drought periods, as this information would directly impact the feasibility of generating hydropower while maintaining a trout fishery. However, no action was taken to re-implement the hydropower production and according to MWRA there are no plans at this time to reactivate the hydropower station at the Winsor Dam. The addition of the communities proposing to join the MWRA water system would not likely have any impact on hydropower at the Winsor Dam nor on any downstream hydropower facilities.

Recreation

Aside from the sport fishery addressed above, there is some boating recreation on the impoundments in Bondsville. Again, these uses will not be affected because operation of Quabbin and Wachusett reservoirs will not change with the Reading transfer.

Wetlands

Other than the Quabbin Reservoir itself, the only significant wetland in the Chicopee River basin that could be affected by the transfer is in Ware, along the Swift River. The area is 70 acres of open water impounded by a dam in Bondsville. Because this area is open water and is part of the river, current minimum flow requirements appear to be adequate to protect the wetland area.

Summary of Reasonable Instream Flow Analysis

The analyses of release data indicate there will be no change in the operation of the Quabbin and Wachusett Reservoirs in response to the proposed Reading transfer or other communities proposing to join the MWRA water system included in the analysis. Downstream flows will continue to meet all applicable permit and regulatory requirements. Current resources will be unaffected by the transfer. The Commission recognizes that current conditions represent a highly engineered environment. Modifications to the timing and magnitude of releases to the Nashua River (i.e., intermediate flows) may be beneficial to the downstream aquatic habitat. The Secretary of EOE has instructed the WRC to address the instream flow needs of the Ware, Swift, and Nashua River basins during its review of ITA applications for MWRA water and as part of the ongoing dialogue among MWRA, DFW, WRC and other stakeholders. This recommendation attempts to address the balance between water supply needs and aquatic habitat needs of flow, water quality and water temperature in the Swift, Ware, and Nashua Rivers.

Criterion #6 Groundwater/Pumping Test

This criterion is not applicable to this proposal. MWRA has surface water sources.

Criterion #7 Local Water Resources Management Plan

A Draft Local Water Resources Management Plan (LWRMP) was approved by the WRC on December 9, 2004. The proponent provided an updated LWRMP with this new ITA application. The plan still requires additional updates. These are outlined in the “Conditions for approval of the Local Water Resources Management Plan” section of this document. (Page 19)

OTHER ISSUES CONSIDERED

In the 2006 NPC Certificate, Secretary Golledge indicated that the SFEIR should provide additional information and analysis related to donor basin issues including releases needed to support fisheries and adequate stream flow in the Nashua River. The SFEIR was to include an update on consultations with state agencies and other groups regarding cumulative impacts and management strategies to support adequate stream flows and ecological protection in donor river basins. An update on MWRA’s consultations with state agencies and other groups was provided in Reading’s SFEIR (November 2006). In summary, as stated in the SFEIR, MWRA and the DCR-OWM have either completed or offered to undertake the following actions:

- MWRA and DCR-OWM have no authority over and do not own the Bondsville Dams, which DFW would like to see removed to improve habitat by mitigating temperature issues, however, the MWRA and the DCR-OWM have stated that they have no objection to removal of the dams by a third party, if this would not impact permit requirements to monitor flow at Bondsville.
- Operations of the turbines at Winsor Dam, which resulted in pulsing flows, no longer occur. Flows since 1991 have been steadier. As stated earlier, there are no plans at this time to reactivate the hydropower station at the Winsor Dam.
- MWRA and DCR-OWM have a history of working with DFW on downstream channel improvements including removal of debris. DCR-OWM will continue to consult with DFW and provide mechanical assistance when possible, to improve habitat in the channel downstream of Winsor Dam.
- DFW has stated that the ramping rates used to reach permit requirements, are too high. MWRA and DCR-OWM will decrease to a rate of approximately 93-186 cfs over the course of an hour.
- DFW has stated that releases in summer should only be cold water, not warm water spills from top of reservoir. MWRA and DCR-OWM have stated that operation of the Quabbin and Wachusett Reservoirs requires maintenance of water quality criteria for drinking water. In maintaining these criteria it was necessary to allow Quabbin to fill in the spring resulting in some uncontrolled spills during the summer. DCR-OWM will work with MWRA to transfer water to Wachusett Reservoir, and so reduce the number of uncontrolled spills in the spring, as water quality concerns permit. This may be possible as the John J. Carroll Water Treatment Plant, located at Walnut Hill in Marlborough was put on line in July 2005.

In the 2007 SFEIR certificate, Secretary Bowles noted that public comments address water management issues that need to be addressed at a broader level by the WRC, MWRA, and other parties and that MEPA review of the Reading proposal did not require complete resolution of the water management issues. The Secretary added the expectation that the WRC would require appropriate management measures to assess and mitigate environmental impacts associated with water supply withdrawals in the Ipswich River watershed and the donor basins. The WRC

looked at the issue of Ipswich River flows and believes that this is more appropriately addressed in the Water Management Act process, since the criteria for approval outlined in the Interbasin Transfer Act and regulations do not address streamflow impacts as a result of existing sources in the receiving basins. The WRC supports DEP's efforts in addressing Ipswich River basin issues in WMA permits for the Ipswich River basin. In-stream flow needs of the Ware, Swift, and Nashua basins were to be addressed by the WRC in its review of interbasin transfers from the MWRA system and as part of the on-going dialogue among MWRA, DFW, and other stakeholders. The Water Resources Commission is currently coordinating with these agencies, to continue this dialogue. MWRA and DCR Watershed Division have created an inter-departmental task force to assess the current releases at Quabbin, Barre, and Wachusett. The group has been meeting and working for several months. They are preparing a thorough analysis and modeling to assess the current releases and options for modifications and recently met with DFW and EOEEA to discuss this analysis and possible next steps.

EO 385

This Decision is consistent with Executive Order 385, which has the dual objective of resource protection and sustainable development. This Decision does not encourage growth in areas without adequate infrastructure nor does it cause a loss of environmental quality or resources.

CONDITIONS OF THE WRC DECISION

Conditions 1 through 5 of the June 2005 WRC Decision on the previous application by the Town of Reading to purchase water from the MWRA no longer apply and are hereby rescinded. All other conditions remain in effect and are incorporated herein and set forth below. Based on the analyses and concerns expressed about this project, approval of Reading's application under the Interbasin Transfer Act to increase amount of water purchased from the MWRA System is subject to the following conditions. Reading must commit in writing to abide by these conditions.

1. Reading will limit its purchase of MWRA water to 829 million gallons of water annually and provide the DEP Annual Statistical Reports to the WRC for the first five (5) years after this approval, to determine if the programs in place are successful in keeping unaccounted-for water at or below 10% and residential gallons per capita per day (gpcd) at 65 or less and to confirm that the interbasin transfer from MWRA to Reading does not exceed the annual limit of 829 million gallons. After the five year period, Reading will provide these reports on request of the WRC Staff.
2. Reading will adhere to a standard of outdoor water use not less stringent than the bylaw currently in effect (July 2005). If Reading further amends this bylaw to reflect full membership in the MWRA, Reading must provide details of how water use restrictions will be imposed, including environmental criteria to be used, for WRC approval before the bylaw is adopted by the Town.
3. Reading must continue effective demand management programs that meet the Interbasin Transfer Performance Standards for Criterion #3, Water Conservation.
4. Reading will provide documentation to the WRC on the progress of the on-going program meter replacement by December 31, 2007. Annual reports must be provided to the WRC until all meters have been replaced.
5. If the amount of unaccounted-for water increases to greater than 10%, Reading must either provide an explanation of why this has occurred and why this occurrence is

unusual (e.g. water main break, large fire, etc.) or provide a plan, for WRC approval, to reduce unaccounted-for water to acceptable levels.

6. If per capita residential water use increases above 65 gpd, the Town must implement a comprehensive residential conservation program that seeks to reduce residential water use through a retrofit, rebate or other similarly effective program for encouraging installation of household water saving devices, including faucet aerators, showerheads and toilets and through efforts to reduce excessive outdoor water use, including the imposition of seasonal water use rates and other measures. If this occurs, the Town must provide a plan for this program to the WRC for approval.
7. Reading must update its water conservation plan to reflect 2006 revision of the Water Conservation Standards for the Commonwealth of Massachusetts. This revised plan must be submitted to WRC Staff within a year of the approval of this transfer.
8. Reading must continue provide annual reports detailing the water conservation actions taken as part of the four-year, \$1 million program. This should include an accounting of the money spent and the successes of the program.
9. If, in the future, it becomes economically viable to build a drinking water treatment plant in town and reactivate and treat local wells, Reading must notify the WRC for consideration of the implications of this in-basin availability on this ITA approval. If use of these wells would result in an increase in the rate of transfer of wastewater out of basin, Reading must file a request for approval with the WRC for an increase over the present rate of interbasin transfer for these wells. Reading is sewered to the Massachusetts Coastal basin, therefore local in-town sources are transferred out of basin as wastewater. By virtue of claiming that its local sources are currently not viable at any time (except under a DEP emergency declaration) for drinking water purposes, and therefore an Interbasin Transfer from the Chicopee and Nashua basins is needed to meet the Town's water supply needs, Reading forfeits its "grandfathered" rights to use its local sources under the Interbasin Transfer Act, except under a DEP emergency declaration.
10. In addition, if Reading's wells are reactivated without a treatment plant and used in a manner that is jurisdictional under the Interbasin Transfer Act, Reading, or the proponent of use of these wells, must file a request for approval with the WRC for an increase over the present rate of interbasin transfer for these wells.

Conditions for approval of the Local Water Resources Management Plan

Reading must revise and update its Local Water Resources Management Plan to reflect the circumstances of this approval. A revised plan must be submitted to WRC Staff within six months of this approval. When all updates have been made, Staff will bring the plan to the WRC for approval. In addition, the following specific changes must be made:

- References to MWRA's determination of "reasonable instream flow" should be eliminated. If the reference is a direct quote, the quotes should be deleted and paraphrased. Under the ITA, it is the WRC, not the entity proposing to sell water, that determines "reasonable instream flow".

